To add to the confusion the term "fore-arm" is employed occasionally (pp. 89, 90, 93, 95, 100 and 103).

On p. 445 it is stated that the cat's body "consists almost entirely of oxygen, hydrogen, carbon, and nitrogen, and largely of protoplasm." Students would certainly be pardoned for concluding from this statement that protoplasm is an element simply equivalent to oxygen or any of the other elements enumerated. On p. 456, the following sentence occurs: "Our present task is then to see what is implied in saying the cat is a 'beast' or a 'mammal.'" To do this we must know its relations simply as a mammal, to the other forms of vertebrate life, *i. e.*, to the groups Pisces, Batrachia, Branchiata, Reptilia, Aves, Monocondyla, and to all the non mammalian vertebrates taken together." Here there is no indication whatever that the terms "Branchiata" and "Monocondyla" designate more comprehensive groups than the terms immediately preceding them. Again on p. 524 it is said: "But are not a piece of oak and wood-ashes different substances? Yet does not fire gradually transform the former into the latter?" This sounds like the science of the 13th century; and such a teacher might find himself embarrassed by a student's inquiry of what becomes of alcohol, which under the influence of fire changes neither to visible smoke nor to ashes.

The author's nomenclature conforms as little as possible to the principles of a true scientific terminology so ably presented in No. 38, vol. II, of this journal. He mostly employs the terms of human anatomy, but makes them refer to the natural attitude of the cat instead of to that of man for whom they were designed. Hence such terms as "above," "below" which mean cephalic and caudal respectively in man, mean dorsal and ventral as used by the author, that is, positions differing 90 degrees from those of human anatomy. The use and meaning of the terms are nowhere given, and to add to the confusion, nearly every term proposed in human or comparative anatomy may be found in some part of the book, and often two words are used together, as on p. 176, where the large intestine is said to be "behind" "below" the stomach.

But perhaps the source of greatest surprise and regret to those who are ready to welcome every book of this kind is the absence of references to most of the writers who have contributed to our knowledge of the cat's biology. One unfamiliar with the literature of comparative anatomy would certainly conclude that none but the author had ever made the cat a subject of careful study. No reference is made to Cuvier, and the splendid monograph of Straus-Durckheim on the bones, ligaments and muscles is nowhere mentioned. The frontispiece recalls very vividly the similar, but more artistic figures of Straus-Durckheim. The names of Prof. Huxley and Claude Bernard are absent from the book, and no reference is made to Mr. Wallace or his magnificent work on the Geographical Distribution of Animals. The author might be pardoned for not having seen the scattered papers of lesser writers, but to charge him of ignorance of these would seem about equally objectionable to the accusation of intentionally withholding credit where credit is due.

It is also to be regretted that there is no intimation on the part of the author that there may be errors or omissions in the book, and that no special lines of inquiry are pointed out to the earnest students for whom it was written. In the present state of knowledge, there must be many things concerning any animal that cannot be understood, yet the attempt to treat the biology of an animal in a complete and philosophical manner is a new step, and worthy of all commendation. It is confidently expected that this book, so excellent in plan, will do the best any book can do; it will awaken true interest, and stimulate inquiry in the great field of biology.

SIMON H. GAGE.

ROYAL SOCIETY (EDINBURGH).

PROFESSOR HELMHOLTZ, on April 17, in an interesting communication on electrolytic conduction, stated, that the experiments he was about to describe were a continuation of experiments he had formerly made in connection with certain objections that had been urged against Faraday's law of electrolysis. He had already shown that a feeble galvanic current could be passed through an electrolytic preparation of acidulated water, even though the electromotive force was not sufficient to decompose the water. The action of such a current would be, in the first place, to coat the electrodes, the one with hydrogen, the other with oxygen. The hydrogen however speedily combined with the free oxygen in the air and liquid to form water, while the oxygen on the positive electrode as speedily dissipated itself. In this way the polarization in the electrolytic cell was kept down, so that the original current was never wholly destroyed, In the later experiments Prof. Helmholtz had completely removed the air from the neighborhood of the electrolyte. This was effected by an ingenious use of the property possessed by palladium of hoiding large quantities of hydrogen gas in its pores. With this specially-prepared cell, he found that a feeble current passed through it, fell down to zero in a very short time, the difference of potential due to the polarization of the electrodes quite balancing the original electromotive force. On throwing off the battery the polarized electrolytic cell showed on a delicate galvanometer a reversed current, which rapidly fell to zero from an intensity equal to that of the original current before polarization set in. Another result to which his researches had led him was, that there were no *chemical* forces acting between the molecules of an electrolyte other than those that existed in virtue of what might be called their electric charges—a result which cannot fail to have an important bearing upon the question of chemical constitution.

SIR WILLIAM THOMSON communicated a short paper on the average pressure due to impulse of vortex-rings on a solid. When a vortex-ring is approaching a plane large in comparison to the dimensions of the ring, the total pressure over the surface is *nil*. When a ring approaches such a surface it begins to expand, so that, if we consider a finite portion of the surface the total pressure upon it due to the ring, will have a finite value when the ring is close enough. In a closed cylinder any vortex-ring approaching the plane end will expand out along the surface, losing in speed as it so does, until it reaches the cylindrical boundary, along which it will crawl back, on rebounding, to the other end of the cylinder. As it approaches, it will therefore exert upon the plane surface a definite outward pressure, whose time-integral is equal to the original momentum of the vortex, and a precisely equal pressure as it leaves the surface. Hence, in the case of myriads of vortex-rings bombarding such a plane surface, though no individual vortex-ring leaves the surface immediately after collision, for every vortex-ring that gets entangled in the condensed layer of drawn-out vortex-rings another will get free, so that in the statistics of vortex-impacts the pressure exerted by a gas composed of vortex-atoms is exactly the same as is given by the ordinary kinetic theory, which regards the atoms as hard elastic particles.

PROFESSOR TAIT, in a brief paper on the crushing of glass by pressure, indicated certain results he had obtained by experiments, which were in good accord with the mathematical theory of the strains to which a closed cylindrical glass tube under high pressure is subjected. Of the three stresses, radial, tangential, and longitudinal, which may be regarded as acting upon any elementary portion of the wall of the tube, the two former have a *shearing* effect, to which the crushing of the tube is due. From the few experiments that had been completed it appeared that the shear required to disintegrate ordinary lead glass was about $1 \pm \frac{1}{260}$.— Prof. J. Blyth gave an account of experiments which he had made on the cause of the sounds produced in the microphone receiver. He also exhibited another form of telephone, in which the vibrating membrane was attached rigidly to a copper wire dipping into a column of mercury which formed along with the wire part of the circuit. The inductive effect of the current on itself caused the wire and

the attached membrane to vibrate in exact correspondence with the variations of the current.

The following interesting letter from Sir Isaac Newton was recently shown for the first time at a *Conversazione* in London given to entertain Professor Helmholtz.

London; *Dec.* 15, 1716.

"Dear Doctor: He that in ye mine of knowledge deepest diggeth, hath, like every other miner ye least breathing time, and must sometimes at least come to terr; alt for air.

"In one of these respiratory intervals I now sit doune to write to you, my friend.

"You ask me how, with so much study, I manage to retene my health. Ah, my dear doctor, you have a better opinion of your lazy friend than he hath of himself. Morpheous is my best companion; wthout 8 or 9 hours of him yr correspondent is not worth one scavenger's peruke. My practizes did at ye first hurt my stomach, but now I eat heartily enow as y' will see when I come down beside you.

"I have been much amused by ye singular *φενομενα* resulting from bringing of a needle into contact with a piece of amber or resin fricated on silke clothe. Ye flame putteth me in mind of sheet lightning on a small—how very small—scale. But I shall in my epistles abjure Philosophy whereof when I come down to Sakly I'll give you enow. I began to scrawl at 5 mins frm 9 of ye clk, and have in writing consmd 10 mins. My Ld. Somerset is announced.

"Farewell, Gd bless you and help yr sincere friend

"(Signed) ISAAC NEWTON.

"To Dr. Law, Suffolk."

Mr. W. Grylls Adams describes in *Nature*, certain electrical effects experienced during a storm on a mountain:

"We reached the top of the Jungfrau Joch at 10.5 A. M., and were met by a violent hail storm, which came rolling up from the northern side of the Col. We at once started to return, and had been walking for two hours down the centre of the Aletsch glacier when the electrical effects began to be felt; we reached the Mërjelen See at 3.15, so that at the time of the occurrence we had reached the lower part of the *névé* which is farthest from surrounding mountain tops, where the glacier is widest. We were enveloped in cloud, above which there were no doubt other clouds charged with electricity, and as they approached we were gradually being charged more and more strongly by induction from the lower cloud, and when the discharges or thunder occurred we were suddenly relieved by an electric shock. A kind of *brush discharge* of gradually increasing intensity went on for some minutes, followed by a sudden shock, and this process of bringing us up to the right state of excitement, to be relieved by a sudden shock, was repeated over and over again several times.

The hissing sounds were first heard in the alpenstocks, and gradually increased in loudness up to the sudden discharge. There were clear indications that as condensers of electricity we were not all of the same capacity. We were roped together in threes: in one set of three I was in the middle, with a guide in front and Mr. Sowerby behind. Whilst the charging was going on I felt the pricking sensation at the waist on the side where the cord was knotted, showing that those who were more influenced by electrical induction were charging the others through the rope which acted as a conductor. Judging by his actions, our guide (a young and active man) was strongly influenced by the charge, whilst Mr. Sowerby, the most staid and venerable of the party, was certainly influenced the least. In the other set of three the elderly J. M. Claret of Chamouni was least affected, whereas Mr. Watson, who was not the youngest of the party, was the most powerfully affected. These facts point to a direct relation between the temperament of the individual and his capacity for being excited electrically or his inductive capacity.

I should add that Mr. Packe has had similar experiences, but apparently, to a less extent, in his walks in the Pyrenees.

NOTES.

STORAGE OF ELECTRICITY.—A new secondary battery, of greatly enlarged capacity, is now attracting attention in Paris. It is the invention of M. Faure, but is confessedly a development of the well-known secondary battery of M. Planté, which is formed of sheets of lead immersed in acidulated water. The latter gains in capacity as the process of charging and discharging is repeated, through increasing thickness of the layer of peroxide of lead that is slowly formed by the currents. M. Faure has conceived the idea of coating the two electrodes with layers of minium, or the red oxide of lead, and by this means the capacity is greatly increased. The Faure battery is stated to have forty times the power of accumulation of the Planté. A battery weighing 75 kilogrammes will develop 75 kilogrammètres, or one horse-power, during one hour. As to the nature of the action, the electric current appears to change the minium to peroxide on the positive electrode, and to reduce lead on the negative. In discharging, the reduced lead is oxidized, and the peroxidized lead is reduced. The battery was lately exhibited by M. Reynier to the Society for the Encouragement of National Industry. There were 24 couples, weighing seven kilogrammes each, connected to a Siemens machine of medium size; these furnished a work of 47 kilogrammètres, which is about a third of M. Reynier's figures; but the conditions were unfavorable. Next, a band of platinum, three mètres long, 12 millimètres broad, and 4-10ths of a millimètre thick was made to glow; then two incandescence-lamps were lighted. The superiority to the Planté battery was well demonstrated. Some competent physicists speak hopefully of M. Faure's battery as a means of distributing electricity to any house or workshop independently of others that may be supplied, and free from the drawbacks of a system of canalisation. The method is also regarded as very promising for domestic electric lighting. A company, it may be added, has been lately started in Paris by M. Philippart, for obtaining force and light by electricity, by combination of the Reynier and Faure batteries. M. Hospitalier has pointed out the expensiveness of charging the Faure battery with electricity from chemical action.

THERMAL ELECTROLYSIS.—Dr. J. H. Gladstone and Mr. Alfred Tribe found that when sheet silver was plunged into fused silver chloride, or iodide of silver, crystals of silver formed on the sheet. Similarly, when copper was immersed in fused cuprous chloride, copper crystals were deposited on it, and when zinc was placed in melted zinc chloride, or iron in melted ferrous chloride, these two metals crystallized on the plates. They found this to be due, not to a difference in the physical condition of the rolled metals, but to the unequal heating of the different parts of the immersed metals. By the contact theory of voltaism, there will be a difference of potential between the metal and the liquid chloride in contact with it, and this difference of potential will vary with temperature. Since all parts of the immersed metal cannot be supposed always at the same temperature there is the possibility of a current being set up and consequent electrolysis of the salt. This view was corroborated by heating the fused salt unequally, when a crop of crystals appeared on a silver rod plunged in the cooler part of the liquid. Again, two silver rods connected together were plunged, the one in a hotter the other in a cooler part of the fused silver chloride, and at the end of fifteen minutes the latter was studded with crystals of silver, whilst the former was clean. A galvanometer showed a stronger current between the rods the greater the difference of temperature between the parts of the fluid in which they were placed; and transposing the rods reversed this current.

LIGHTNING WITHOUT THUNDER.—M. d'Abbadie.—The author describes a phenomenon of this kind which he witnessed in Africa when a thin fog occupying a narrow valley was suddenly illuminated by sheet lightning. He points out that in this case the ordinary explanation of so-called "heat lightning" as the mere reflection of a storm below the horizon is inapplicable.